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The effects of sensory integration and sensory motor treatment of hyperactive behavior

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San Jose State University, 1994

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THE EFFECTS OF SENSORY INTEGRATION AND SENSORY MOTOR TREATMENT ON HYPERACTIVE BEHAVIOR

A Thesis

Presented to

The Faculty of the

Department of Occupational Therapy

San Jose State University

in Partial Fulfillment

of the Requirements for the Degree

Master of Science

by Jody Ventura

May, 1994

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ABSTRACT

THE EFFECTS OF SENSORY INTEGRATION AND SENSORY MOTOR TREATMENT ON HYPERACTIVE BEHAVIOR

BY JODY VENTURA

The purpose of this study was to examine the effects of sensory integration and sensory motor therapy on hyperactive behavior. The research methodology is single case study with pretest - posttest design.

The subjects were six children, ages four to six, who were chosen from those who participated in two of the San Jose State University Pediatric Occupational Therapy clinics. The children received individualized sensory integration and sensory motor therapy from San Jose State University Occupational Therapy students under the supervision of university professors.

Hyperactive behavior was measured using the hyperactivity index of the Revised Conners Parent Rating Scale. Children with the summed score of 15 or more were defined as hyperactive according to this scale. The scale was completed by the parents of the subjects on three occasions.

Five of the six subjects completed the 12 weeks of clinic. Four of these five subjects demonstrated decreased hyperactive behavior as recorded by the parents ratings on the Revised Conners Parent Rating Scale.

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CHAPTER ONE

INTRODUCTION

Purpose of the Study

The purpose of this study was to determine the effectiveness of sensory integration and sensory motor therapy on hyperactive behavior as measured by the Revised Conners Parent Rating Scales.

Statement of the Problem

The incidence of hyperactivity in school age children is between 5 and 12 percent (Fine, 1980; Gadow, 1986; Whalen & Henker, 1980). According to Fine (1980), the ratio of boys to girls is 7:1. Psychotropic drugs have been prescribed more frequently for hyperactivity than for any other childhood disorder (Ciccone, 1990). In 1983, researchers found that 90% of hyperactive children were prescribed Ritalin, 5% Dexedrine, 2% Cylert, and 3% nonstimulant drugs (Gadow, 1986).

There are many disadvantages to pharmacological therapy. The performance of hyperactive children treated with drugs is no better in the long run than that of hyperactive children who do not receive drug therapy (Gadow, 1986; Jensen, Xenakis, Shervette, Bain, and Davis, 1989; Whalen & Henker, 1984). Hechtman (1985) and Ottenbacher & Cooper (1983) reported that pharmacological therapy is not a contributing factor in improvement in academic performance by hyperactive children. There are also many side effects from the drugs. The most common are insomnia, anorexia, slowing of growth (height and weight), changes in mood appearing as depression, headache, abdominal pains, increased heart rate and blood pressure, and changes in appearance

called "amphetamine look" (Gadow, 1986; Ross & Ross, 1976). Pharmacological therapy has also been associated with psychological side effects, such as low self-esteem (Cantwell, 1985). The hyperactive child knows that he or she is different from other children and may come to believe that his or her more appropriate behavior is due to the "good child pill." With drugs, the child is not allowed to use internal powers for self-control. Drugs do not treat the problem; rather, they mask the symptoms. Pharmacological therapy may not be the best answer to hyperactivity. An alternative treatment is proposed with sensory integrative and sensory motor therapy. However, there is a controversy regarding the causal factors underlying hyperactivity and the effectiveness of sensory integration and sensory motor therapy with individuals displaying hyperactive behavior. Throughout the literature three common theories of the underlying dysfunction of hyperactive behavior are proposed. They are neurological, behavioral, and dietary in nature. Choice of treatment depends on the purported dysfunction. Therefore, if central nervous system dysfunction is the suspected cause of hyperactive behavior, it follows that remediation and treatment of the central nervous system should be the appropriate treatment. There is also evidence that the child's brain has plasticity and is capable of change. According to Stepp-Gilbert (1988), "If the child has a sensory integration problem, sensory integration treatment is the most beneficial in attempting to help the child's brain organize" (p. 314). With the scarcity of health resources, the value of sensory integration and sensory motor therapy should be assessed since it requires long hours of individual treatment sessions for weeks or months.

Question

The question generated for this study was: Does sensory integration and sensory motor therapy which includes vestibular, tactile, and proprioceptive stimulation decrease hyperactive behavior?

Definitions

The following terms used in this study have been defined :

Distractibility: Increased "likelihood of being drawn off task by extraneous stimuli" (Barkley, 1981, p. 19).

Hyperactive behavior: "A constant high level of activity that is manifested in situations where it is clearly inappropriate and is coupled with an inability to inhibit activity on demand" (Ross & Ross, 1976, p. 288).

Impulsivity: "Failure to inhibit responding" spontaneously in an appropriate manner (Barkley, 1981, p. 13).

Proprioceptive Input: Pertaining to the awareness of position, movement, and change in equilibrium and the knowledge of postural shifts, weight, and resistance of objects in relation to the body.

Sensory Integrative Therapy: "Treatment involving sensory stimulation and adaptive responses to it according to the child's neurologic needs. Therapy usually involves full body movements that provide vestibular, proprioceptive, and tactile stimulation. The goal of therapy is to improve the way the brain processes and organizes sensations" (Ayres, 1985, p.184).

Sensory Motor Therapy: A treatment regime which involves sensory stimulation

including proprioceptive, tactile and vestibular stimulation such as vibration, deep pressure, joint traction and compression exercises, therapeutic touch, spinning and inverting a child on equipment, table top activities, etc.

Tactile Input: Pertaining to the discriminative sense of touch on the skin.

Vestibular Input: Pertaining to linear acceleration and deceleration, position of the head in relation to gravity and rotary movements.

Assumptions

The assumptions made by the researcher concerning this study were:

1. Each parent interprets the definition of the symptoms that are listed on the questionnaire the same way. The same definition of the measurement intervals used to rate the behaviors is also consistently understood by the parents.
2. The parents will provide unbiased and accurate reporting of their child's behaviors.

Limitations

Limitations of this study are:

1. The two sensory integration clinics differed slightly in that one clinic incorporated a 15 minute period for Attending Activities while the other clinic did not.
2. Caution must be exercised as the results of this study cannot be generalized due to the small sample size.
3. The treatment was provided by students with various degrees of expertise.

Significance of the Study

Reduction of hyperactive behavior is important for numerous reasons. One reason

is that symptoms associated with hyperactivity remain with 50 to 80 percent of the said population into adulthood (Cantwell, 1985; Last & Hersen, 1989). People with hyperactive behavior have been found to develop antisocial personality disorders (Bloomingdale & Bloomingdale, 1988; Cantwell, 1985). According to Gittleman, Mannuzza, Shenker, and Bonagura (1985), the chance of developing conduct disorder is four times greater for hyperactive adolescents than for those without hyperactivity, with 2/3 of those adolescents demonstrating drug and alcohol abuse. Cowart (1988) looked at hyperactivity in adulthood and found that many felons and substance abusers demonstrated hyperactive behavior as children.

Hyperactivity also affects learning (Cantwell, 1985). Children who demonstrate hyperactive behavior are unable to attend to the task at hand. Woolf and Zuckermann (1986) and Hechtman (1985) found that academically, the adolescent with hyperactive behavior is two school years behind his counterpart.

If the dysfunction could be remedied before the child reaches adolescence, not only has the neurological dysfunction been minimized, but the child will have had a period of time to experience achievement and build self-esteem. Pharmacological therapy does not remedy the dysfunction; it only masks the symptoms.

This study explored the efficacy of using sensory integration and sensory motor therapy on hyperactive behavior. The results of this study add to the body of knowledge whether sensory integration and sensory motor treatment techniques are effective in treating children with hyperactive behavior and make it possible to strengthen the existing therapy with research. This research addressed the underlying dysfunctional disorders.

Other treatment techniques used with children who show hyperactive behavior do not. Sensory integration and sensory motor therapy could be an alternative to these treatment techniques which in addition to failing to address the underlying dysfunction also take the locus of control over behavior away from the child.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter gives an overview of the hyperactive child and the role of the nervous system in hyperactivity. The theory behind sensory integration and sensory motor therapy with hyperactive children is briefly visited. First, the symptoms and concerns regarding hyperactive individuals followed by the proposed theories of the etiology of hyperactivity are examined. A delay in the maturity of the nervous system, in particular, the tactile system is proposed as an alternative theory regarding the etiology of hyperactivity. The tactile system and the role of the vestibular system are discussed. Next, the human developmental process and how sensory integration dysfunction affects the process are examined. Finally, sensory integration and sensory motor therapy and specific treatment techniques are discussed.

The Hyperactive Child

The hyperactive individual will display various symptoms, with degrees of behavior variation. Some of the more common symptoms related to hyperactivity are distractibility, impulsivity, and motor restlessness. These symptoms may differ in their expression, severity, and frequency across differing situations. The inattentive or distractible child is not unable to pay attention. Rather, the child is unable to attend in situations in which he or she is expected to attend because the child is distracted by extraneous environmental stimuli.

The hyperactive child is not more active than other children. Rather, he or she

displays excessive activity in settings which are more restrictive and require more concentration. This excessive activity is disorganized, inappropriate for the situation, inconsistent with the goals of the environment, and not goal directed.

Hyperactivity affects all areas of the child's life. Behaviorally, the hyperactive child displays more non-compliance and exhibits risk-taking behavior, is excessively talkative, and is sometimes more aggressive with his peers. Academically, it is estimated that 60 to 80 percent of children with hyperactive behavior have a learning disability (Barkley, 1981; T. Jensen personal communication, October 4, 1990) They have difficulty focusing on tasks, as well as organizing and completing work. Underachievement is common and continuous monitoring of the child's educational program is required.

Physically, these children appear to be more clumsy and uncoordinated than other children. Many are smaller and thinner than other children of the same age. Children with hyperactive behavior have more auto immune and physical ailments than other children (Barkley, 1981). Socially and emotionally, these children have unpredictable moods swings and inappropriate behavior. Hyperactive children are easily frustrated. They have difficulty in social situations and are seen by peers as immature, intrusive and irritating.

A common problem of concern with hyperactive children is low self-esteem. This problem is probably due to lack of success experiences and too many failures. Also, the negative interaction with parents, teachers, siblings and peers adds to the sense of self as a failure. As the child becomes an adolescent, different scenarios could occur. For a few

children with hyperactive behavior, all the symptoms could disappear or all the symptoms could persist into adulthood. For others, the symptoms could decrease in frequency and intensity due to the development of increased self-control during adolescence. Yet, for most, motor restlessness may disappear, but attention deficits, impulsiveness, and distractibility may persist causing inability in adolescents to organize themselves in purposeful activities. As previously stated, adolescents and adults with hyperactive behavior have a higher chance of developing anti-social personality disorder (Bloomingdale & Bloomingdale, 1988) and a greater chance for criminal behavior (Cowart, 1988).

Etiology

Throughout the literature, there are several theories regarding the etiology of hyperactivity. Some of these include minimal brain damage, ingestion of food additives and preservatives in the diet, genetic predisposition, and cognitive perceptual dysfunction. An alternative theory regarding etiology of hyperactivity is a delay in the maturity of the nervous system (Ayres, 1964, 1971, 1972a, 1972b, 1985; Barkley, 1981; Kimball, 1986; Werry, Scaletti, & Mills, 1990); in particular, the tactile system (Ayres, 1964, 1971, 1972a, 1972b, 1985; Bauer, 1977; Fine, 1980; Royeen & Fortune, 1990).

Bauer (1977) studied responses to tactile stimulation between hyperactive and nonhyperactive children. He found a statistically significant difference in responses between the two groups. The hyperactive group made more negative responses, demonstrated more stimulus reduction, withdrawal, distractions, anxiety, increased motor movement, and test incompletion than the nonhyperactive group. He concluded that

hyperactive children are more tactile sensitive than nonhyperactive children.

The most common tactile dysfunction is sensory defensiveness (Pypher, 1980). Ayres (1964, 1985) used the term tactile defensiveness and described it as an aversive reaction to noxious tactile stimuli causing excessive emotional reactions, hyperactivity, or other behavioral problems.

The Tactile System and Tactile Dysfunction

The tactile system, which develops in utero, is the largest sensory system, with the skin being the main receptor for sensations of touch, pressure, texture, temperature, pain, and movement of the hairs on the skin (Ayres, 1985). It is hypothesized that the tactile system is a "dual functional cutaneous afferent system" (Royeen, 1986, p. 414). It is comprised of a protective system which responds to stimuli with a fight or flight response - movement, alertness and increased affect and a tactile-discriminative system which allows interpretation of the temporal and spatial nature of stimuli for cognition. If there is an imbalance between the two systems with the protective system dominating, theoretically, touch defensiveness, hyperactivity, and distractibility may result (Bauer, 1977; Pypher, 1980; Royeen, 1986).

This lack of balance is believed to be the result of incoming tactile information being "modulated at the level of the spinal cord . . . this modulation is dependent on information descending from higher levels of the central nervous system" (Royeen & Fortune, 1990, p. 155). A transmission deficit anywhere in the central nervous system can cause a disruption in the balance between the dual tactile systems.

Touch defensiveness may result from a defect in one or a combination of the

following functional mechanisms in the central nervous system. First, information from the higher centers in the central nervous system may be inadequate or improperly organized and can not effectively integrate sensory input at the level of the spinal cord. Second, abnormal resting activity levels of the spinal cord modulation centers may not allow appropriate filtering and modulation of incoming sensory transmissions. Third, supraspinal centers may not be transmitting appropriate facilitory or inhibitory signals to lower levels of the central nervous system (Royeen & Fortune, 1990).

One of the primary brain stem modulation centers is the reticular formation which is synaptically connected to every sensory system, to many motor neurons, and to most of the cortex. The reticular formation plays a role in (1) processing and integrating sensory motor activities; (2) arousal; (3) organizing the activities of the cerebral hemispheres; and (4) filtering common stimuli from reaching consciousness. This allows for the focus of attention. If the cortical inhibitory pathways are defective and there is not enough inhibition to the reticular formation, it becomes excitable and responds with excessive activity and is easily facilitated by tactile stimulation.

An important study conducted by Zametkin, Nordahi, Gross, King, Semple, Rumsey, Hamburger, and Cohen (1990) compared glucose metabolism in the brains of normal adults and adults with hyperactivity of childhood onset using a PET scan. They found that adults with hyperactivity exhibited reduced glucose metabolism in certain areas of the brain which play a role in attention control and motor activity. They also found reduced glucose metabolism in the somatosensory cortex, which may play a role in the oversensitivity of the tactile system due to decreased inhibition.

The Vestibular System

The vestibular system has many functions. One of its main functions is to act as a framework for the other senses. The vestibular system "exercises influence over all other ongoing sensory experiences" (Ayres, 1972a, p. 57). "All sensations are processed in reference to this basic vestibular information" (Ayres, 1985, p.37). It is the unifying system of the central nervous system. Another of its main roles is "to prime the nervous system to function effectively" (Ayres, 1985, p. 37). If the vestibular system is not functioning effectively, the interpretations of other sensations (especially tactile) will be inconsistent and inaccurate and the level of arousal of the nervous system will be unbalanced.

When studying the sensory integrative status of the child, one can expect "simultaneous disorder in more than one neural system and probably in some systems not yet identified " (Ayres, 1971, p. 333; Ayres, 1972b; Kimball, 1986). Ayres (1971) discovered that tactile, proprioceptive, and vestibular processing problems were the primary deficits in children displaying hyperactive behavior.

Effect of Sensory Integrative Dysfunction on Human Development

Dysfunction of the tactile, vestibular, and proprioceptive systems affects a child's functional skills throughout their developmental process (Appendix A). At birth, the vestibular, proprioceptive, and tactile systems come together to facilitate adaptive behaviors and normal development. For example, vestibular and proprioceptive senses are integrated to facilitate posture, balance, gravitational security, and muscle tone. The tactile system facilitates sucking, eating, mother-infant bond, and tactile comfort. Next,

the vestibular, proprioceptive, and tactile systems are integrated to facilitate body percept, attention span, motor planning, activity level, coordination, and emotional stability. Then the visual and auditory systems are integrated. The auditory system and the vestibular system come together to facilitate speech and language. The visual system is integrated with the three basic systems to facilitate eye-hand coordination, purposeful activity, and visual perception. Finally, all senses are integrated to facilitate the skills that the child needs to function effectively.

This account emphasizes how the tactile, proprioceptive, and vestibular systems are the building blocks of human development. The tactile system facilitates emotional attachments with the mother and allows the child to be able to eat. The vestibular and proprioceptive systems allow for posture and gravitational security to develop. This influences the child's ability to move in space. Without the integration of these systems, the child reacts poorly to the environment and has a delay in development.

Often, the child continues to perform, despite these deficits, due to the development of splinter skills. A child can learn to perform a skill to compensate for dysfunctional sensory integration. But it takes more effort and concentration and may not carry over to other areas of life.

Sensory Integration Therapy

Ayres (1985) hypothesized that "Much of hyperactivity in children today is due to poor sensory integration" (p. 9). Sensory integration is the "organization of sensation for use" (Ayres, 1985, p. 5). With sensory integration treatment, sensory input is controlled by the therapist in order to activate the brain mechanisms and improve the brain's ability

to organize sensory information for use. Children have an inner drive for sensory integration (Ayres, 1985). They will naturally seek sensations that help organize the brain. The child with sensory integrative dysfunction will avoid following his or her inner drive, so the therapist must encourage the child to choose the activities that will help his or her brain develop.

Ayres (1985) observed that treatment is most effective when the child directs his or her own actions because integration occurs when a child wants something and initiates an activity to get it. Sensory integration therapy treats and corrects the underlying dysfunction of hyperactive behavior rather than masking the symptoms like other therapies. An assumption made in sensory integration therapy is that the brain is plastic and capable of change. "The brain is designed so that the functions that are used are the functions that are most likely to develop" (Ayres, 1985, p. 153). With practice (or play in sensory integration therapy), the brain will grow new connections among the neurons which will facilitate more normal sensory integration.

> The central idea of this therapy is to provide and control sensory input, especially the input from the vestibular system, muscles and joints, and skill in such a way that the child spontaneously forms the adaptive responses that integrate those sensations. (Ayres, 1985, p. 140)

An adaptive response is a "purposeful, goal-directed response to a sensory experience" (Ayres, 1985, p. 6). It helps the brain to develop and organize itself. Before one can make an adaptive response, the sensation from his or her body and environment must be organized and integrated. The adaptive response contributes to the development

of the ability to organize one's behavior. The resulting motor output then leads to further integration of sensations that arise from making that response. "A well-organized adaptive response leaves the brain in a more organized state" (Ayres, 1985, p. 14). The adaptive response is the foundation of appropriate behaviors.

Adaptive responses also help build self-esteem. The child with poor sensory integration realizes that he is different and has had many experiences with failure. When a child can meet the demands of the environment and respond to challenges with effective behavior, he receives satisfaction and a sense of achievement. Sensory integration treatment provides the opportunity for a child to make an adaptive response. It also allows the child to take control of his or her own behavior.

Sensory Motor Therapy

Sensory motor therapy has been defined as a treatment regime which involves sensory stimulation including proprioceptive, tactile and vestibular stimulation such as vibration, deep pressure, joint traction and compression exercises, therapeutic touch, spinning and inverting a child on equipment, as well as table top activities.

According to Knickerbocker (1980), children with sensory motor deficits will terminate play with and avoid those toys for which they do not have the skills that will provide a successful experience with that toy. They also avoid exploration of the environment for fear of frustration and failure. These children will not develop the foundation for learning, and the academic tasks which are built on the foundation of skills attained by playing with these toys which the child perceives as threatening or distracting will be delayed. Also, the primary sensory system dysfunction can lead to secondary

symptoms which affect the child's ability to adapt to experiences found in day-to-day life.

Knickerbocker's (1980) goal for children with sensory motor deficits is "to enable him to bring organization out of disorganization in sensory input, motor output, social responses, and academic performance so that, insofar as possible, he can function as an equal among his peers" (p. 23). To do so, Knickerbocker recommends use of simple therapeutic equipment, toys and table top activities. Each piece of equipment recommended has an inherent goal. The equipment is structured so that it focuses the child's attention toward that goal. Therefore, the child is allowed to be in control of the activity yet achieve the desired goal. The table top activities help to organize and refine the sensory system with multisensory input. The child also learns to apply the sensory motor foundation skills that he gains through play with the equipment. Table top activities are also easily graded to allow the child to progress toward more difficult levels following the developmental process. The therapy session begins with maximal structure and gradually progresses to minimal structure as the child's sensory system organizes itself. Sensory motor therapy is non-directive so that the child is allowed to explore freely and there are no stated goals so there is no threat of failure. The child is in control and has fun. Activities are chosen for the action which the activity requires. The child is the guide and is allowed to choose from among the activities in the structure. This decision will be based on the child's most urgent needs. Additional opportunities to satisfy the need that the child expresses should be provided. Once the need is fulfilled, the child will be able to move onto higher level activities.

Specific Treatment Techniques

Studies have shown that tactile stimulation can help reestablish the balance between the protective and discriminative systems. One technique includes pressure with cutaneous stimulation, for example, rubbing with a rough cloth or brisk brushing with a surgical brush. Initially, the child can apply the stimulation himself by rubbing his skin with textures ranging from course to fine (Ayres, 1964; Pypher, 1980).

Deep pressure helps to organize a hyperactive and distractible child. It provides a calming effect. A therapist may provide deep pressure by putting the child between two mats, pretending to be a hamburger, then pressing down on the child pretending to be adding ketchup and mustard (Ayres, 1985).

Linear vestibular stimulation, for example, riding the scooter board down a ramp, helps to normalize the tactile system, reducing hyperactive behavior and energizing the nervous system for purposeful activity (Ayres, 1985).

Arnold, Clark, Sachs, Jakim, and Smithies (1985) studied the effect of vestibular stimulation versus vestibular and visual stimulation versus visual stimulation alone on hyperactive behavior. They found that the best results were achieved from the vestibular stimulation only condition. They concluded that vestibular stimulation was effective for treating hyperactive behavior.

Occupational Therapy Frame of Reference

Children with sensory integrative and sensory motor dysfunction do not have the skills they need to adequately function in the performance areas of motor, cognition, social and psychological. With sensory motor and sensory integrative therapy the child

can master developmental tasks and skills required for adaptive behavior and will also build a foundation for play, academic performance, social skills and self-esteem. Integration of the performance components (sensory integrative functioning, motor, cognition, social and psychological) is necessary for the child to be successful in his occupational roles in the areas of self-care, play, education and work (Pedretti & Pasquinelli, 1990).

Summary

Hyperactivity affects all areas of a child's life including physical, behavioral, academic, social and emotional. One theory of the etiology regarding hyperactivity is that the child has a delay in the maturity of the nervous system, in particular, the tactile and vestibular systems. If sensory integrative and sensory motor dysfunction is the purported cause of hyperactive behavior, then sensory integration and sensory motor therapy should be the treatment of choice. Sensory integration and sensory motor therapy provide a self-controlled treatment which remedies the underlying dysfunction instead of masking the symptoms and provide the child with numerous successful experiences.

The results of this particular study will help determine the effectiveness of sensory integration and sensory motor therapy in treating children with hyperactive behavior and make it possible to strengthen the existing therapy with research.

CHAPTER THREE

DESIGN AND METHODOLOGY

Design

A single case study design with pretest and posttest was used in this research to study the effects of sensory integration and sensory motor therapy on hyperactive behavior. Six subjects were chosen from among children who participated in two of the San Jose State University Pediatric Occupational Therapy clinics. In this study, the subjects served as their own controls. The independent variable was sensory integration and sensory motor treatment that included tactile, vestibular, and proprioceptive stimulation used to inhibit and facilitate the central nervous system (See Appendix B for clinical treatment procedures and Appendix C for sample treatment techniques). The children received sensory integration and sensory motor therapy twice a week from San Jose State University Occupational Therapy students under the supervision of two San Jose State University professors. The dependent variable was the level of hyperactive behavior as scored by the parents of the subjects using the hyperactivity index of the Revised Conners Parent Rating Scale.

Question

The question generated for this study was: Does sensory integration and sensory motor therapy which includes vestibular, tactile, and proprioceptive stimuli decrease hyperactive behavior?

Subjects

The subjects were five children who were clients of the San Jose State University

Pediatric Occupational Therapy Clinics where therapy was provided by Occupational Therapy undergraduate students under the guidance of two professors. Three of the subjects were male, and two were female. Subjects were between the ages of four and six and exhibited hyperactive behaviors as defined by the Revised Conners Parent Rating Scale.

Therapists

The therapists were San Jose State University Occupational Therapy students who were educated in sensory integration and sensory motor therapy. Each student was assigned to a specific child throughout the semester and was the primary person responsible for administering sensory integration and sensory motor treatment. Students received instruction on sensory integration and sensory motor treatment and were supervised by two San Jose State University professors.

Data Collection Techniques

The dependent variable, hyperactive behavior, was measured by the children's parents using the Revised Conners Parent Rating Scale (See Appendix D). The revised scales are the most commonly used scales in research and clinical practice with hyperactive children (Barkley, 1981; Cohen, Kelly & Atkinson, 1989; Last & Hersen, 1989; Mash & Terdal, 1988). The scale includes a list of symptoms which are rated on a four point scale: 0- not at all, 1- just a little present, 2- pretty much present, and 3- very much present.

The parent questionnaire is a 48 item scale which was standardized on 570 children, ages 3 to 17 with the mean age of 9.9 years. Fifty-five percent of the subjects

were male and 45 percent female. The interrater reliability between the parents is between .46 and .57. The scale has construct validity in that it does discriminate between nonhyperactive and hyperactive children and it does measure the effects of various types of treatment, especially drug therapy (Goyette, Conners, & Ulrich, 1978; Rutter, Tuma, & Lann, 1988). Six measurable factors have been extracted from the parent questionnaire: two conduct areas, learning problems, psychosomatic, impulsive/hyperactive, and anxiety.

The measure with which this study is concerned is the hyperactivity index which measures level of hyperactive behavior and is based on questions 4, 7, 11, 13, 14, 25, 31, 33, 37, and 38 (Barkley, 1981). The total points for the items comprising the hyperactivity index are summed and divided by the number of items in that factor (10 items). A mean score of 1.5 or higher or a summed score of 15 or higher is accepted as indicating hyperactive behavior (Barkley, 1981).

A limitation of the Revised Conners Parent Rating Scale is that there is a potential for a practice effect. Scores have been noted to decline between the first and second administration of the test (Barkley, 1981; Last & Hersen, 1989; Mash & Terdal, 1988; Rutter, Tuma, & Lann, 1988).

Procedure

The parents of the children in the clinics were contacted by telephone and asked to meet with the researcher on the first day of clinic. The researcher explained that the study would examine the effects of sensory integration and sensory motor therapy, provided through the clinic, on the children's behavior. The parents' responsibilities were explained and it was emphasized that this study would have no effect on the children . The children

were not aware that they were the subjects in the study. The parents were not specifically told the purpose of the study; however, the parents of all the children were asked to complete the questionnaire in order to identify the children who were eligible to participate in the study. Parents were also asked to sign a consent form for completing the initial questionnaire (See Appendix E). The consent form carried the title of the study. Two parents declined to complete the initial questionnaire. Six parents completed the questionnaire which provided subjects from among the children in the clinics. The children selected had the highest scores above 14 on the hyperactivity index of the Revised Conners Parent Rating Scale.

The parents of the six subjects were contacted by the researcher who explained that their children met the eligibility requirements to participate in the study. On the second day of clinic the parents were asked to sign another consent form in order to participate in the study and they were given a copy of the subject's rights. They were also asked to complete the Revised Conners Parent Rating Scale again in order to provide a baseline for the subjects' behavior and in an effort to diminish the "practice effect," which is common with the Revised Conners Parent Rating Scale.

Each subject was assigned a number in order to establish anonymity. Treatment consisted of sensory motor therapy during one hour sessions twice a week for approximately 12 weeks (See Appendices B and C for clinic treatment procedures and sample treatment techniques). At the end of the 12 weeks, the parents were given the questionnaires to complete and returned them to the researcher through the mail.

CHAPTER FOUR

DATA AND RESULTS

Introduction

A descriptive analysis of the data is presented in this study. The data were collected using the Revised Conners Parent Rating Scale which has an index used to measure hyperactive behavior. Data were collected at the beginning and end of the 12 weeks of therapy in two of the San Jose State University Pediatric Occupational Therapy clinics.

Question

The question generated for this study was: Does sensory integration and sensory motor therapy which includes vestibular, tactile, and proprioceptive stimulation decrease hyperactive behavior?

Subjects

The subjects were children participating in two of the Pediatric Occupational Therapy clinics at San Jose State University. The study began with six children between the ages of four and six. All of the subjects displayed hyperactive behavior as defined by the Revised Conners Parent Rating Scale. This definition is a summed score of 15 or more on a ten item hyperactivity scale. Three of the subjects participated in one clinic and three participated in a separate clinic, both with sensory motor emphasis. One child did not complete the sessions so he was eliminated from the study.

Subjects A, B, and C were in clinic I. Subject A was a six year old male who completed 10 of 18 sessions. Subject B was a six year old male who completed 17 of 18

sessions. Subject C was a six year old female who completed 18 of 18 sessions. Subjects D, E, and F were in clinic II. Subject D was a six year old female who completed 18 of 20 sessions. Subject E was a four year old male who completed 16 of 20 sessions. Subject F was a four year old male who competed 13 of 20 sessions. Subjects F did not complete the clinic so was eliminated from the study. (See Table 1)

Data Presentation

The following tables present the pretest and posttest data from the Revised Conners Parent Rating Scale for each subject. (Tables 2 - 7)

Four of the five subjects showed a decrease in their scores between the pretest and the posttest of the Revised Conners Parent Rating Scale. This represented a decrease in hyperactive behavior according to the rating scale. One of the subjects showed an increase in hyperactive behavior by one point according to the rating scale.

Tables two through six illustrate the pretest and posttest answers to the questions relevant to the hyperactivity index of the Revised Conners parent Rating Scale for each subject.

The sensory integration and sensory motor therapy which included vestibular, tactile, and proprioceptive stimulation did appear to help decrease hyperactive behavior in four of the five subjects according to the scores of the Revised Conners Parent Rating Scale which were provided by the parents of the subjects.

Results

Six subjects were chosen for the study but only five of the six completed the clinics. Subject F completed 13 of 20 session and did not complete the clinic, and

Table 1

Demographics of Subjects

Subject	Age	Sex	# of sessions completed
A	6	M	10/18
B	6	M	17/18
C	6	F	18/18
D	6	F	18/20
E	4	M	16/20

therefore was eliminated from the study. Of the five subjects, four showed a decrease in hyperactive behavior according to the Revised Conners Parent Rating Scale. One subject showed an increase in hyperactive behavior by one point on the rating scale. Hyperactive behavior was defined as a summed score of 15 or more according to the Revised Conners Parent Rating Scale. These results provide data to show that sensory integration and sensory motor therapy which included vestibular, tactile, and proprioceptive stimulation helped to decrease the hyperactive behavior of these subjects. .

Table 2

Revised Conners Parent Rating Scale Pretest and Posttest Scores for Subject A

Question	Pretest	Posttest
1. Excitable, impulsive	1	2
2. Cries easily or often	0	1
3. Restless in the "squirmy" sense	2	2
4. Restless, always up and on the go	2	2
5. Destructive	0	0
6. Fails to finish things	2	1
7. Distractibility or attention span a problem	2	2
8. Mood changes quickly and drastically	0	0
9. Easily frustrated in efforts	1	1
10. Disturbs other children	0	0

Key: 0 - Not at all; 1 - Just a little present; 2 - Pretty much present; 3 - Very much present.

Table 3

Revised Conners Parent Rating Scale Pretest and Posttest Scores for Subject B

Question	Pretest	Posttest
1. Excitable, impulsive	2	2
2. Cries easily or often	0	0
3. Restless in the "squirmy" sense	2	2
4. Restless, always up and on the go	1	1
5. Destructive	1	1
6. Fails to finish things	2	1
7. Distractibility or attention span a problem	3	3
8. Mood changes quickly and drastically	1	1
9. Easily frustrated in efforts	3	2
10. Disturbs other children	1	1

Key: 0 - Not at all; 1 - Just a little present; 2 - Pretty much present; 3 - Very much present.

Table 4

Revised Conners Parent Rating Scale Pretest and Posttest Scores for Subject C

Question	Pretest	Posttest
1. Excitable, impulsive	3	2
2. Cries easily or often	1	0
3. Restless in the "squirmy" sense	3	1
4. Restless, always up and on the go	3	2
5. Destructive	3	2
6. Fails to finish things	3	2
7. Distractibility or attention span a problem	3	2
8. Mood changes quickly and drastically	2	2
9. Easily frustrated in efforts	3	2
10. Disturbs other children	3	2

Key: 0 - Not at all; 1 - Just a little present; 2 - Pretty much present; 3 - Very much present.

Table 5

Revised Conners Parent Rating Scale Pretest and Posttest Scores for Subject D

Question	Pretest	Posttest
1. Excitable, impulsive	3	2
2. Cries easily or often	3	2
3. Restless in the "squirmy" sense	2	2
4. Restless, always up and on the go	3	2
5. Destructive	2	1
6. Fails to finish things	2	1
7. Distractibility or attention span a problem	3	2
8. Mood changes quickly and drastically	2	1
9. Easily frustrated in efforts	3	2
10. Disturbs other children	3	2

Key: 0 - Not at all; 1 - Just a little present; 2 - Pretty much present; 3 - Very much present.

Table 6

Revised Conners Parent Rating Scale Pretest and Posttest Scores for Subject E

Question	Pretest	Posttest
1. Excitable, impulsive	3	2
2. Cries easily or often	2	0
3. Restless in the "squirmy" sense	2	2
4. Restless, always up and on the go	3	2
5. Destructive	2	1
6. Fails to finish things	2	2
7. Distractibility or attention span a problem	3	3
8. Mood changes quickly and drastically	1	0
9. Easily frustrated in efforts	2	2
10. Disturbs other children	2	2

Key: 0 - Not at all; 1 - Just a little present; 2 - Pretty much present; 3 - Very much present.

Table 7

Pretest and Posttest Scores of the Revised Conners Parent Rating Scale

Subject	Sum of Pretest Scores	T Score	Sum of Posttest Scores	T Score
A	10	57	11	59
B	16	70	14	65
C	27	100+	17	82
D	26	100+	17	82
E	22	87	16	72

CHAPTER FIVE

IMPLICATIONS FOR THE PROFESSION

RECOMMENDATIONS AND SUMMARY

Introduction

This purpose of this study was to examine the effects of sensory integration and sensory motor therapy on hyperactive behavior. The question for the study was: does sensory integration and sensory motor therapy which includes vestibular, tactile, and proprioceptive stimuli decrease hyperactive behavior? The results of this study were that four of the five subjects demonstrated a decrease in hyperactive behavior as defined by the Revised Conners Parent Rating Scale after twelve weeks of sensory integration and sensory motor therapy.

Implications For The Profession

The results of this study support the belief that sensory integration and sensory motor therapy decrease hyperactive behavior. One of the symptoms of hyperactive behavior discussed earlier was distractibility and motor restlessness. With a decrease in distractibility and motor restlessness, the child may be better able to attend to the task at hand and better able to organize his or her behavior to be goal directed. This may lead to an improvement in academic performance.

Sensory integration and sensory motor therapy give a child control over his or her behavior rather than relying on the "good child pill," as in pharmacological therapy. With an increase of success experiences comes an increase in self-esteem.

With the scarcity of resources available, each form of treatment for hyperactive

behavior should be studied to determine its effectiveness in decreasing hyperactive behavior. There is a need for further research to strengthen the existing data supporting sensory integration and sensory motor therapy as a treatment for hyperactive behavior. If sensory integration and sensory motor therapy become viable forms of treatment for hyperactive behavior, there may be a decrease of pharmacological therapy which has many negative side effects. Instead of masking the symptoms, sensory integration and sensory motor therapy can minimize the underlying dysfunction which causes hyperactive behavior.

Bloomingdale and Bloomingdale (1988) found that hyperactive behavior often develops into antisocial behavior disorder as the child matures. Cowart (1988) found that children with hyperactive behavior have a greater chance for criminal behavior. An early intervention which minimizes the underlying dysfunction of hyperactive behavior may decrease the likelihood of developing antisocial behavior disorder or demonstrating criminal behavior.

Recommendations

Recommendations suggested to improve this study are:

1. Case studies for each subject should be developed in depth and should include the evaluations and treatment plans for each subject. Also the therapists' notes of the subjects' participation and daily observations should be included.
2. The research design should be revised to an A-B-A or A-B-A-B format to include data collection of behavior during baseline, treatment, and withdrawal periods.
3. Any replication of this study should be comprised of a larger sample.

The major recommendation for further research is to study the effects of sensory integration and sensory motor therapy on hyperactive behavior in children in various settings in order to provide for generalization of the results.

Summary

Hyperactive behavior in children is manifested by distractibility, impulsivity and motor restlessness. It affects the behavioral, academic, physical, social and emotional components of a child's life. Low self-esteem, due to the lack of success experiences and many failure experiences, is a concern with children with hyperactive behavior. Also antisocial personality disorder (Bloomingdale & Bloomingdale, 1988) and criminal behavior (Cowart, 1988) in adolescence and adulthood have been associated with hyperactive behavior in childhood.

There are several theories regarding the etiology of hyperactive behavior. One of these theories is that the child has a delay in the maturity of the nervous system. In particular, Ayres (1971) discovered that tactile, proprioceptive and vestibular processing problems were the primary deficits in children who displayed hyperactive behavior.

Sensory integration and sensory motor are among the therapies used to treat hyperactive behavior. Unlike other therapies, sensory integration and sensory motor therapy minimize the dysfunction rather than masking the symptoms and gives the child a sense of control over his or her own behavior.

The purpose of this research was to study the effects of sensory integration and sensory motor therapy on hyperactive behavior. Single case study methodology with pretest and posttest design was used for this study. Data collection was conducted using

the hyperactivity index of the Revised Conners Parent Rating Scale. The subjects were six children, ages four to six, who participated in two San Jose State University Pediatric Occupational Therapy clinics for 18 to 20 sessions held over a 12 week period. Each child received individualized therapy from his or her therapist who was a San Jose State University Occupational Therapy student under the supervision of two San Jose State University Occupational Therapy professors. The setting was two open rooms at Kirk Community Center. The parents of each child completed the Revised Conners Parent Rating Scale on three occasions. On the first day of clinic, the parent of each child in the clinic, except for two who declined, completed the questionnaire in order to obtain a sample population of children who displayed hyperactive behavior as defined by the Revised Conners Parent Rating Scale. The parents of the six subjects completed the questionnaire again on the second day of clinic in order to obtain a baseline score of the subjects' behaviors. At the end of the 12 weeks, the parents completed the questionnaire for a final time in order to obtain data on the subjects' behaviors after the 12 weeks of treatment.

Five of the six children completed the 12 weeks of clinic. Four of those five children showed a decrease in hyperactive behavior after receiving 12 weeks of sensory integration and sensory motor therapy in the San Jose State University Pediatric Clinic. Subject A did not show a decrease in hyperactive behavior. It is possible that Subject A did not demonstrate a decrease in hyperactive behavior because he only attended 10 of the 18 sensory integration sessions.

In analyzing the results, the researcher considered the fact that the decrease in

hyperactive behavior could be due to a biased rating from the parents on the Revised Conners Parent Rating Scale. However, these preliminary data are strong enough to warrant further research into the effects of sensory integration and sensory motor therapy on hyperactive behavior. With more research and public education on the effects of sensory integration and sensory motor therapy on hyperactive behavior, it may become more widely acceptable as a viable form of treatment for hyperactive behavior.

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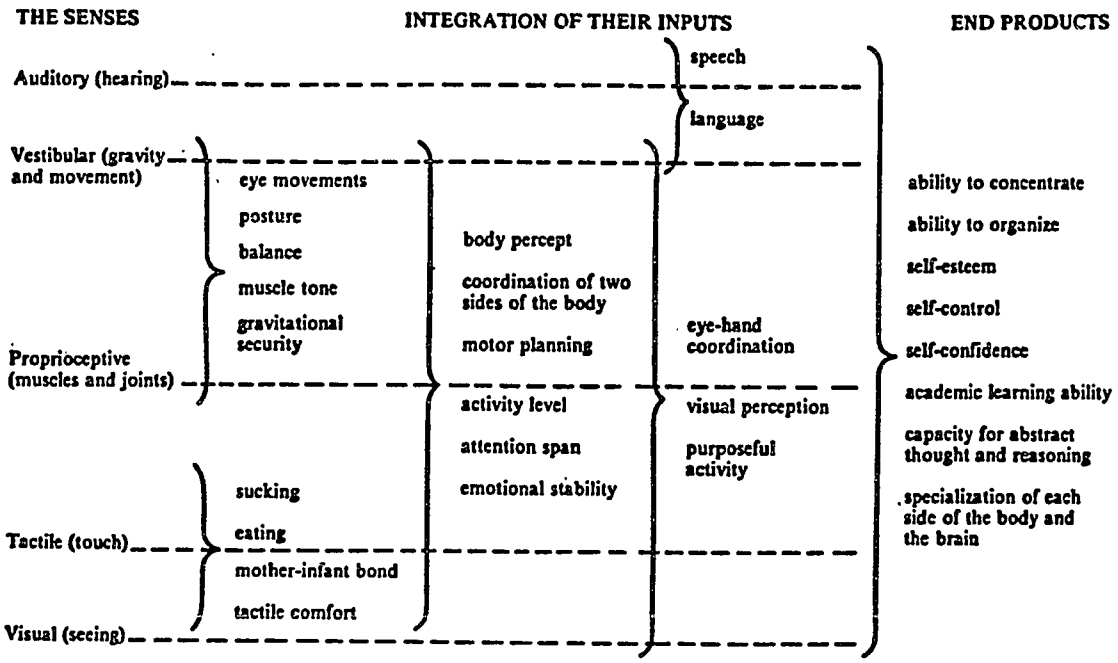
Appendix A

Effects Of Sensory Integrative Dysfunction On Human Development



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Appendix B

Clinical Treatment Techniques

WARM-UP & SENSORY STIMULATION	FACILITATION TECHNIQUES	ATTENDING ACTIVITIES	INHIBITION (CLOSURE) TECHNIQUES
15 mins.	15 mins.	15 mins.	15 mins.
Unroll Ears	Vestibular/Proprio-ceptive Stimulation	Sedentary Activities	"Quiet Time"
Olfactory Stimuli		Teble Top Assembly	Music Soft Lights
Breathing Exercises	Special Sense Stimulation	Games For Attention Span	Positioning
Tactile (Brushing)			
Heads Up	Spinning	Cognitive Activities	Deep Breathing
Vibration	Joint Traction and Compression Exercises	Lazy 8's	Slow Stroking (Bladder Meridian) or Shiatsu
Inversion (Organize)			
Therapeutic Touch	Linear Acceleration and Deceleration		Spinal Warmer (Governing Meridian)
Leg Lift			
Grounding			Ear Warmer
K1 - Base of Big Toe			Centering
Zipping Up (Conception Meridian)			
Colors			

Guy L. McCormack
San Jose Stete University
Occupational Therapy Curriculum

BASED ON RESEARCH IN:

Holistic Health
Sensory Integration
Neurosciences
Psychoneuroimmunology

Appendix C

Sample Treatment Techniques

Sample Sensory Integration and Sensory Motor Therapy Techniques

Tactile Stimulation

1. Sit in tactile tub and brush with various textured objects (sponges, scratch pads, brushes, featherdusters, fuzzies, etc.). Let child start by brushing himself.
2. Light touch.
3. Slow stroking on child's back.
4. Rolling down a mat placed on a ramp.
5. Vibration.
6. Covering the equipment with various textured materials.
7. Shaving cream, powder and lotion that the child can rub on his skin.
8. Rolling the large therapy balls over the child's back and legs.

Vestibular Stimulation and Proprioceptive Stimulation

1. Spin child around in a swing (peter pan swing, bolster swing, hanging net).
2. Tumbling activities on mats (somersaults, egg rolls).
3. Spin child on nystagmus board.
4. Spin child in the carpeted barrel.
5. Scooter board activities and games.
6. Vibration.
7. Jumping on trampoline.
8. Equilibrium board.
9. Inversion
10. Bouncing on the Pogo Ball
11. Obstacle courses.

** All activities here include proprioceptive feedback

Appendix D

Questions Pertaining To The Hyperactivity Index Of The Revised Conners Parent Rating Scale

Questions Pertaining to the Hyperactivity Index of the

Revised Conners Parent Rating Scale

1. Excitable, impulsive
2. Cries easily or often
3. Restless in the "squirmy" sense
4. Restless, always up and on the go
5. Destructive
6. Fails to finish things
7. Distractibility or attention span a problem
8. Mood changes quickly and drastically
9. Easily frustrated in efforts
10. Disturbs other children

*Questions are from the Revised Conners Parents Rating Scale published by Multi-Health Systems, Inc.

Appendix E

Consent Form For Qualification To Participate In Research Project

SJSU SAN JOSE STATE UNIVERSITY

A campus of The California State University

College of Applied Sciences and Arts • *Department of Occupational Therapy*
One Washington Square • San José, California 95192-0059
Main Office: 408/924-3070 • Fieldwork Office: 408/924-3078 • FAX: 408/924-3088

AGREEMENT TO PARTICIPATE IN RESEARCH
SAN JOSE STATE UNIVERSITY

RESPONSIBLE INVESTIGATOR: Jody Ventura
TITLE OF PROTOCOL: The Effects of Sensory Integration and Sensory Motor Treatment on Hyperactive Behavior

This research study is investigating the effects of sensory integration and sensory motor treatment on hyperactive behavior. The results of this study should further our understanding of the effectiveness of sensory integration and sensory motor therapy in treating hyperactive behavior. The symptom questionnaire I am asking you to complete will allow the investigator to decide if your child is appropriate for the study. Your child may or may not be chosen to participate in the study, but this will in no way affect their right to participate in the clinic.

I understand that

1) My child will not be asked to do anything out of the ordinary. He/she will continue to attend clinic and receive sensory integration and sensory motor therapy. I will periodically be asked to complete a checklist used to identify symptoms of my child's behavior.

2) I have been informed that this study poses no expected risks to my child.

3) The possible benefit of this study to my child is a continuous evaluation of his/her improvement due to sensory integration and sensory motor treatment.

4) The results from this study may be published, but any information from this study that can be identified with my child will remain confidential and will be disclosed only with my permission.

5) My consent is given to allow my child's teacher to give out data that will be gathered on the symptom checklist.

6) Any questions about my child's participation in this study will be answered by Jody Ventura (408)446-4950. Complaints about the procedures may be presented to Professor Guy McCormack at (408)924-3084 or Dr. Lela Llorens, Chair, Department of Occupational Therapy at (408)924-3072. For questions or complaints about research subject's rights, or in the event of research-related injury, contact Serena Stanford, Ph.D. (Associate Academic Vice President for Graduate Studies & Research) at (408)924-2480.

7) My consent is given voluntarily without being coerced; my child may refuse to participate in this study or in any part of this study, and I may withdraw my consent at any time, without prejudice to my relations or my child's with SJSU.

8) I understand that my refusal for my child to participate in this study will in no way affect my child's right to participate in the clinic.

9) I have received a copy of this consent form for my file.

HAVING READ THE INFORMATION PROVIDED ABOVE, I HAVE MADE A DECISION WHETHER OR NOT MY CHILD MAY PARTICIPATE AND IS WILLING TO PARTICIPATE.

_____ _____ _____

DATE PARENTS/GUARDIAN'S SIGNATURE PRINT CHILD'S NAME

RELATION TO CHILD:_____

_____

INVESTIGATOR'S SIGNATURE

Appendix F

Consent Form For Research Project

SJSU SAN JOSE STATE UNIVERSITY

A campus of The California State University

College of Applied Sciences and Arts • Department of Occupational Therapy
One Washington Square • San José, California 95192-0059
Main Office: 408/924-3070 • Fieldwork Office: 408/924-3078 • FAX: 408/924-3088

Dear Parents,

Your child has been invited to participate in a research project which is studying the effects of sensory integration and sensory motor therapy on hyperactive behavior. Your child has been selected as he/she is a participant in the Pediatric Occupational Therapy Clinic and exhibits the symptoms of excessive motor activity.

This study poses no risks to your child and all information which could be identified with your child will be kept confidential.

Your child will not be asked to do anything out of the ordinary. He/she will continue to attend clinic and receive sensory integration and sensory motor therapy. You will periodically be asked to complete a checklist used to identify symptoms of your child's behavior. The study will run from September 1991 until December 1991.

If you have any questions regarding the study, please contact Jody Ventura, graduate student, at (408)446-4950 or Professor Guy McCormack at (408)924-3084.

Attached is a consent form. Please read the consent form carefully and return the signed form to Jody Ventura or Guy McCormack before September , 1991.

Thank you for your cooperation.

SJSU SAN JOSE STATE UNIVERSITY

A campus of The California State University

College of Applied Sciences and Arts • Department of Occupational Therapy
One Washington Square • San José, California 95192-0059
Main Office: 408/924-3070 • Fieldwork Office: 408/924-3078 • FAX: 408/924-3088

AGREEMENT TO PARTICIPATE IN RESEARCH
SAN JOSE STATE UNIVERSITY

RESPONSIBLE INVESTIGATOR: Jody Ventura
TITLE OF PROTOCOL: The Effects of Sensory Integration and Sensory Motor Treatment on Hyperactive Behavior

Your child is invited to participate in a research study that is investigating the effects of sensory integration and sensory motor treatment on hyperactive behavior. The results of this study should further our understanding of the effectiveness of sensory integration and sensory motor treatment in treating hyperactive behavior.

I understand that

1) My child will not be asked to do anything out of the ordinary. He/she will continue to attend clinic and receive sensory integration and sensory motor therapy. I will periodically be asked to complete a checklist used to identify symptoms of my child's behavior.

2) I have been informed that this study poses no expected risks to my child.

3) The possible benefit of this study to my child is a continuous evaluation of his/her improvement due to sensory integration and sensory motor treatment.

4) The results from this study may be published, but any information from this study that can be identified with my child will remain confidential and will be disclosed only with my permission.

5) My consent is given to allow my child's teacher to give out data that will be gathered on the symptom checklist.

6) Any questions about my child's participation in this study will be answered by Jody Ventura (408)446-4950. Complaints about the procedures may be presented to

Professor Guy McCormack at (408)924-3084 or Dr. Lela Llorens, Chair, Department of Occupational Therapy at (408)924-3072. For questions or complaints about research subject's rights, or in the event of research-related injury, contact Serena Stanford, Ph.D. (Associate Academic Vice President for Graduate Studies & Research) at (408)924-2480.

7) My consent is given voluntarily without being coerced; my child may refuse to participate in this study or in any part of this study, and I may withdraw my consent at any time, without prejudice to my relations or my child's with SJSU.

8) I understand that my refusal for my child to participate in this study will in no way affect my child's right to participate in the clinic.

9) I have received a copy of this consent form for my file.

HAVING READ THE INFORMATION PROVIDED ABOVE, I HAVE MADE A DECISION WHETHER OR NOT MY CHILD MAY PARTICIPATE AND IS WILLING TO PARTICIPATE.

_____ _____ _____

DATE PARENTS/GUARDIAN'S SIGNATURE PRINT CHILD'S NAME

RELATION TO CHILD:_____

_____

INVESTIGATOR'S SIGNATURE

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